

**PRODUCTION OF POLYMER NANOCOMPOSITES
USING SUPERCRITICAL FLUIDS**

Abstract of the Disclosure

A method and system of forming a polymer nanocomposite. A layered clay and polymer are selected wherein $|S_p - S_{scf}| > |S_c - S_{scf}|$ and $|S_c - S_{scf}| \leq 2.0 \text{ (cal/cm}^3\text{)}^{0.5}$ are satisfied. S_p , S_c , and S_{scf} is a solubility parameter of the polymer, clay, and a supercritical fluid (SCF), respectively. The polymer and clay are mixed to form a polymer-clay mixture. The polymer-clay mixture is melted to form a polymer-clay melt. The polymer-clay melt is initially contacted with the SCF while the SCF is subject to an initial pressure exceeding the critical pressure of the SCF and to a temperature exceeding the critical temperature of the SCF. The polymer-clay melt is further contacted with the SCF while the SCF is at a lower pressure below the critical pressure of the SCF to exfoliate the clay to form the nanocomposite having the exfoliated clay being substantially dispersed throughout the polymer of the polymer-clay.